this condition are seen in the Marsupials, and in a still higher degree in the small order of Monotremes. These present a marked approach to the *Sauropsida*, or reptile and bird group. Such semi-transitional forms, as they may be called, furnish valuable indications of the route by which the higher types might have been brought about, and appear, upon the evolutionary hypothesis, to be unmodified survivors of a condition which was only transitory in the large bulk of the class. Their value as evidence for gradual development would be greatly strengthened if corroborated by palæontology. Beyond them nothing is known in the present condition of life of any truly intermediate forms between the Mammalia and the other class of vertebrates, and the same must be said, as far as we know at present, of all former ages. The line which we now draw round the class to separate it from all others will include within its limits all hitherto discovered mammalian remains. No forms more transitional, or approaching nearer to any other class, or even, as we shall see, so near as do the Monotremes, occur in the records of palæontology. Of course our evidence on the subject is only negative, and as such has little real value. The first appearance, of which we are at present informed, of mammals upon the earth, was early in the Mesozoic period, in the epoch called Triassic. At that time the other classes of Vertebrata, except, perhaps, birds (but our evidence here is defective), had long been well established and distinctly defined. Indications of mammalian life occur in various formations, at different ages, and at scattered points upon the earth's surface, throughout the Mesozoic ages, but during its later stages are entirely lost. These indications, though very fragmentary, all show animals of minute proportions, and for the class to which they belong, rather low organisation. With the commencement of the Tertiary period, however, a total change takes place. Wherever the great Cretaceous ocean bottoms have been elevated so as to become the fit habitation of terrestrial animals, there mammals of varied size, form, and function have been found to dwell, and have left their remains, and from henceforth to the present time there is abundance of evidence of their continuous occupation of the earth's surface. The total absence of all marine mammals in the Cretaceous epoch, the fauna of which is, on the whole, so well preserved, and the absence of land mammals in the Wealden, are facts, which though difficult to account for, must not be overlooked.

Before proceeding to the consideration of the history of the special groups of Mammalia, attention may be called to a few points of general interest relating to the whole class, in which palæontological researches appear to have shown some evidence of gradual modification or progression as time advanced. The first is a small point, as it relates only to one family of animals, but it affords a good illustration of the parallelism which has been observed between the development of the race and that of the individual. The earliest known forms of deer, those of the Lower Miocene, as remarked by Gaudry, have no antlers, as the young of the existing species. The deer of the Middle Miocene have simple antlers, with not more than two branches, as in existing deer in the second year. In the Upper Miocene, species occur with three branches to the antlers, but it is not until the Upper Pliocene and Pleistocene times, that deer occur with antlers developed with that luxuriance of growth and beauty of form, characteristic of some of the existing species in the perfectly adult state. Next, the teeth in the greater number of Eocene mammals, both herbivorous and carnivorous, were of a much more generalised character than at present, and, as shown by Owen, commonly presented the full typical number of three incisors, one canine, four pre-molars, and three molars in each side of each jaw, making forty-four in all, a number found only in two genera at present existing. These teeth, moreover, in many species were more uniform in character and regularly placed, without intervals, in the jaws than in most of the later forms. They were also usually very short-crowned, and many cases can be traced of a successive lengthening of the crowns of the molars, and consequent greater provision for the wear of the organ, in a closely allied series of animals passing through successive geological epochs. Lastly, as remarked first by Lartet, and subsequently by Marsh, there has been in many groups a gradual increase of the size of the brain, as ascertained by the capacity of the interior of the cranium. Most of the Eocene mammals had very small brains in proportion to their size; this is well exemplified in the earliest known European Eocene carnivorous mammal, *Arctocyon primævus*, and still more strikingly in the huge American *Dinocerata*, animals nearly as large as the existing elephants, but whose brain cavity more resembles that of a reptile, being not more than one-eighth the capacity of that of a rhinoceros. The Miocene mammals of the same country had better developed brains, but even in the Pliocene Mastodons they did not equal the existing Proboscidea. A similar progression of brain capacity has been observed among deer, among the tapiroid Ungulates, and in a very well marked manner among equine mammals, especially from the Eocene *Orohippus*, through *Miohippus* and *Anchitherium* of the Miocene, *Pliohippus* and *Hipparion* of the Pliocene, to the recent *Equus*.

(*To be continued.*)

MADAGASCAR[1]

As most probably many of our readers know, a wealthy Parisian, M. Alfred Grandidier, who is thoroughly acquainted with Madagascar in all its aspects, has undertaken a mighty work on the physical, natural, and political history of the island, which is to form, when completed, twenty-eight volumes in large quarto, profusely illustrated with coloured plates. Six volumes, three of text and three of plates, are to be devoted to the Mammals, the first of each of these being those under notice on the present occasion. They, together with the Birds, in three volumes, and the Crustacea, are under the editorship of M. Alph. Milne-Edwards. The Fishes are undertaken by Dr. Sauvage; the Reptiles by M. Grandidier; the Insects by MM. Kunckel d'Herculais, Lucas, Oustalet, De Saussure; the Annelids by M. L. Vaillant, and the Mollusca by MM. Fisher and Crosse.

In the volumes before us there are 122 plates devoted to the anatomy of the Lemurian family *Indrisinæ*. *Propithecus diadema*, *P. edwardsii*, *P. verreauxii*, *P. deckenii*, *P. coquerelii*, *P. coronatus*, *Avahis* (*Microrhynchus*) *laniger*, *Indris brevicaudatus* are the species figured. Of these plates, thirty-nine refer to their osteology, more than twenty to their myology, forty to their visceral anatomy, thirteen to their external form, and twelve (as photographs) to the configuration of the feet. Most of these plates are exquisitely coloured, and all are beautifully drawn; the livers being the only organs with which we have any fault to find. The volume of letterpress only extends as far as the myology, the account of the viscera not having yet appeared. It is to do so in March next. From the drawings alone many particularly instructive facts may be learnt. The colic caecum of *Propithecus* is seen to be comparatively short and capacious, at the same time that the helix formed by the convolutions of the colon itself is as considerable as in any ruminant animal. In *Avahis* the helix is much less developed, whilst the caecum is longer. In *Indris* the caecum is enormously long, not being wide, the colic coil not forming a helix, but being disposed in parallel

[1] "Histoire Physique, Naturelle et Politique de Madagascar." Publiée par Alfred Grandidier. "Histoire Naturelle des Mammifères." Par MM. Alph. Milne-Edwards et A. Grandidier. Vol. VI. (texte) et Vol. IX. (atlas). (Paris: Imprimerie Nationale, 1875.)

transverse rows. The liver of *Avahis* is represented without any gall-bladder (it may be embedded), this viscus being large, and having, as in the typical lemurs, its fundus reversed from its ordinary position, and buried in the hepatic issue in the two other genera. The caudate lobe of the liver is absent, and the spigelian is of fair size. These points, it may be mentioned, have been previously recorded by Prof. Flower in his Hunterian Lectures before the College of Surgeons in 1872, on the visceral anatomy of the Mammalia. In *Propithecus* the left subclavian artery is shown to be given off from the innominate trunk, whence spring the three other main anterior vessels, whilst in *Avahis* and *Indris* it springs independently from the aorta. As in the other Lemurs and the Swine, the mesenteric arteries run straight to the walls of the viscera they supply, and do not form loops just before they reach them; they anastomose freely at their origins.

M. Milne-Edwards gives as the dental formulæ of the Indrisinæ the following:—

Milk dentition . . . $i\ \frac{2}{2}\ c\ \frac{1}{1}\ m\ \frac{2}{3} = 22$

Permanent dentition . $i\ \frac{2}{2}\ c\ \frac{1}{0}\ p\,m\ \frac{2}{2}\ m\ \frac{3}{3} = 30$

Whether or not this method of expressing the dentition is correct is a matter of uncertainty, it depending on the nature of the outer lower cutting teeth of the typical Lemurs. We cannot, with many zoologists, help retaining the opinion that the outer lower incisor-like teeth of *Lemur* and its nearest allies are canines, and they most certainly represent the outer pair in *Indris*, in which they are larger than the inner. The presence of a third lower milk molar confirms the opinion expressed by Prof. Huxley[1] in his memoir on the Angwántibo (*Arctocebus calabarensis*), that in the adult Indrisinæ it is a premolar which is missing in each semi-jaw.

M. Milne-Edwards gives elaborate measurements of the bones of the three genera, which are also represented in the graphic form, on ordinates, by which means excellent comparisons can be made at a glance.

In the myological section of the work, the contributions by Vrolik on *Stenops*, Messrs. Mivart and Murie on *Nycticebus* and the Lemuroidea generally, Van Campen and Van der Hoeven on the Potto, Burmeister on *Tarsius*, and Prof. Owen on the Aye-Aye are employed for comparison, and the whole monograph has filled the only important gap, till now vacant, in our knowledge of the anatomy of the Lemurs.

SCIENCE AND ART IN IRELAND

AN important announcement as to the proposed action of the Government with regard to the various scientific institutions in Dublin is contained in the following article, which we reprint from the *Times* of Tuesday last:—

The subject of the administration of Science and Art in Ireland in connection with increased State aid has now been under discussion at different times for many years. It must not be imagined, however, that Ireland is not already provided with numerous institutions for the promotion of Science and Art, or that it lacks grants for that purpose. In Dublin alone there are under the management of the Royal Dublin Society, which is a chartered body, a Museum of Natural History, Botanic Gardens (with Botanical Museum), and a library. Next comes a purely national institution, the Royal College of Science, with its small industrial collections and the geological collections of the Geological Survey. On the borderland of Science and Art we have the Royal Irish Academy, with its library and Antiquarian Museum, containing the richest collection of Celtic antiquities existing out of Copenhagen, including the celebrated Tara Brooch and Tara "torques," and the Cross of Cong.

[1] Proc. Zool. Soc., 1864, p. 327.

Coming to the region of Art pure, we have the School of Art, under the management of the Royal Dublin Society; the Royal Hibernian Academy, corresponding to our own Royal Academy (which also has its School of Art); and lastly, the Irish National Gallery. So far as we can gather from the estimates, the total grant to Science and Art Institutions in Dublin is upwards of 25,000*l.* a year, though it is difficult to obtain very precise information on this head, as the votes are taken, some by the Science and Art Department, some by the Treasury, and some by the Office of Works.

The Library, the Natural History Museum, and the Botanic Gardens have since 1865 been entirely supported by the State, though managed by the Dublin Society acting as trustees, while the collections of the Royal Irish Academy, which receive an annual subsidy of about 2,000*l.* besides a house, have been very largely purchased out of public funds. The Royal Dublin Society has of late years devoted its energies and its private funds most usefully in furtherance of agriculture. The Royal Irish Academy not only covers the field of the Royal Society of England, but also takes under its care literature and antiquities.

It will thus be seen, to compare the State supported institutions in Dublin with those in London, that the elements of the British Museum, the Geological Museum, the South Kensington Museum, the National Gallery, and Royal Academy exist in Dublin, to say nothing of the Royal College of Science, which has a more complete course than our own School of Mines. In spite, however, of the number of these institutions, and, in fact, because of their number, the collections, whether of books, natural history specimens, or antiquities, have not had the completeness which one would expect. While on the one hand many have been inconveniently housed, on the other the Government has naturally felt a difficulty in improving their condition so long as they were in the hands of more or less irresponsible private bodies, and hence the many attempts to bring about a consolidation, to which we may briefly refer.

Thus we find that in 1862 the Treasury appointed a small Commission, with Sir C. Trevelyan as chairman, which made certain recommendations. Before these were acted on, however, the subject was, in 1864, taken up by a Committee of the House of Commons, of which Mr. Gregory was chairman. This body dissented widely from the views expressed by the Treasury Commission, and thus the matter rested till 1868, when the Government decided to constitute a separate Department of Science and Art for Ireland, "analogous in its constitution to the existing Science and Art Department in London for the United Kingdom;" and appointed a Committee, of which the Duke of Leinster, then Marquis of Kildare, was chairman, to report on the best means of carrying out the project.

The Committee, having upon it such representative Irish members as the Marquis of Kildare, the Very Rev. Dr. Russell, the then President of Maynooth, the Rev. S. Haughton, and Mr. G. A. Hamilton, the then Secretary of the Treasury, soon found it impracticable to organise such an independent department as had been contemplated, and applied for an enlargement of their instructions; in fact, it became evident very early in the inquiry that all but a small minority in Ireland were in favour of continuing the connection with the English Department. Teachers and students specially petitioned that the connection might be maintained, as they saw clearly that the severance would deprive them of the highest rewards and best promises of a career by cutting off the English field from them. However much some may regret the fact, the fact remains that in all vocations the highest talent will seek the place where it is most highly prized and rewarded, which in the case of the United Kingdom means London.